OAR Box 1214

Prepped by Ollie Stewart

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MVMA SEPTEMBER 12, 1991 STATEMENT REGARDING ETHYL CORPORATION'S APPLICATION FOR FUEL ADDITIVE WAIVER DATED JULY 12, 1991

Good morning. My name is Dave Kulp, Fuel Economy Planning & Compliance Manager for Ford Motor Company (Ford). I am here today to present the MVMA statement to EPA concerning Ethyl Corporation's (Ethyl) fuel additive waiver application for HiTEC 3000, or MMT, at a concentration of 1/32 gram/gallon. Several of the MVMA member companies have indicated that they will submit written comments on their own. Also with me today are Marvin Jackson from General Motors, Gordon Allardyce from Chrysler, and Ron Hurley and Tom Lasley from Ford.

Some of the MVMA member companies have previously expressed concern both to EPA and Ethyl regarding some of the elements of the Ethyl test program designed to evaluate MMT. MVMA does not agree with Ethyl's claim that MMT does not cause or contribute to the failure of emission control devices or systems to meet applicable standards during the useful life. On the contrary, based upon Ford's test data, the Explorer test vehicles failed applicable emission standards after 100,000 miles with MMT. The Escort test vehicles demonstrate a significant increase in HC emission levels after an accumulation of 50,000 miles with MMT.

We are here today primarily to share and discuss with EPA one of our member company's (Ford) test data collected to evaluate the effect of MMT on exhaust emissions, emission devices and control system functional characteristics. The vehicle mileage accumulation and testing for exhaust emissions has been completed. Briefly stated, the Ford test program consisted of eight vehicles accumulating 100,000 miles each; four accumulated mileage with MMT and four without. The four 1991 Escort vehicles had production emission control calibrations, whereas the four Explorer vehicles were calibrated to meet 1993 California or 1994 federal HC standard of 0.40 grams/mile (100,000 miles). It should be noted that all HC data shown on the attached charts is <u>total</u> HC. All vehicles had a 5,000-mile break-in with certification mileage accumulation fuel prior to emission testing. Emission testing was conducted over a 100,000-mile interval with and without MMT starting at

5,000 miles and ending at 105,000 miles. An evaluation of select emission control devices and systems after mileage accumulation is in process. A detailed description of the Ford test program with test results through the first 50,000 miles has already been made available to EPA. Ford submitted this information to the EPA Docket on September 4, 1991. A program report through 100,000 miles will be made available when it is completed.

The tailpipe emission results through 50,000 miles of testing indicate a 30 percent increase in HC with MMT, a decrease in CO and an increase in NOx. The feedgas emissions show the same trends as the tailpipe.

The results of the Ford test program through 100,000 miles demonstrate a statistically significant increase in tailpipe and feedgas HC emissions; these results are attached. The overall deterioration in emission performance greatly increases over the remaining 50,000 miles of testing. The tailpipe HC emission level over 100,000 miles was 200 to 300-percent greater with MMT as compared to vehicles without MMT. In other words, MMT caused a two- to three-fold increase in HC emissions levels. There is little effect of MMT on CO emissions. There is a clear increase in NOx emissions with MMT.

Some of the member companies have speculated that the increase in HC levels is believed to be a result of four factors: Mn_3O_4 deposits in the combustion chamber creating crevices which serve as hiding spots for air/fuel mixtures which pass through the chamber unburned, increasing HC; oxygen sensors coated with Mn_3O_4 changing the engine air/fuel mixture from that intended by the engine design; deposits on the fuel injectors altering the spray patterns and/or prevent closure, thus increasing enrichment in one or more cylinders, leading to increased HC emissions; Mn_3O_4 deposits on the catalyst washcoat leading to increased backpressure which will increase residual gas in the engine, thus increasing HC emissions. The testing results to date seem to indicate this speculation is correct.

Although the Ford fleet accumulated more than 800,000 miles, which is less than Ethyl's 3 million, MVMA believes these Ford data are more representative of the effects of MMT under real-life conditions: based on Ford's use of a mileage accumulation fuel (commercially-available additives) and driving schedule representative of actual customer usage; a break-in period for all vehicles to stabilize emissions; certification representative emission control device and system maintenance; the inclusion of all test data; conducting a much greater (six versus Ethyl's two or three) number of emission tests at each interval resulting in increased statistically significant overall data and a 33 percent greater mileage accumulation and test interval per vehicle.

A functional analysis of emission control devices and systems from the Ford test vehicles is in process. This includes vehicle and bench-type testing. The results will be made available to EPA and other interested parties as it becomes available.

As a part of Ford's test plan, particulate emissions were evaluated during the mileage accumulation. The results through 50,000 miles of testing indicate a modest increase in both the absolute level of total particulate and MN mass emissions. These emissions were both increasing with greater mileage accumulation. The results of this testing have been previously made available to EPA. Ford submitted this information to the EPA Docket on September 4, 1991.

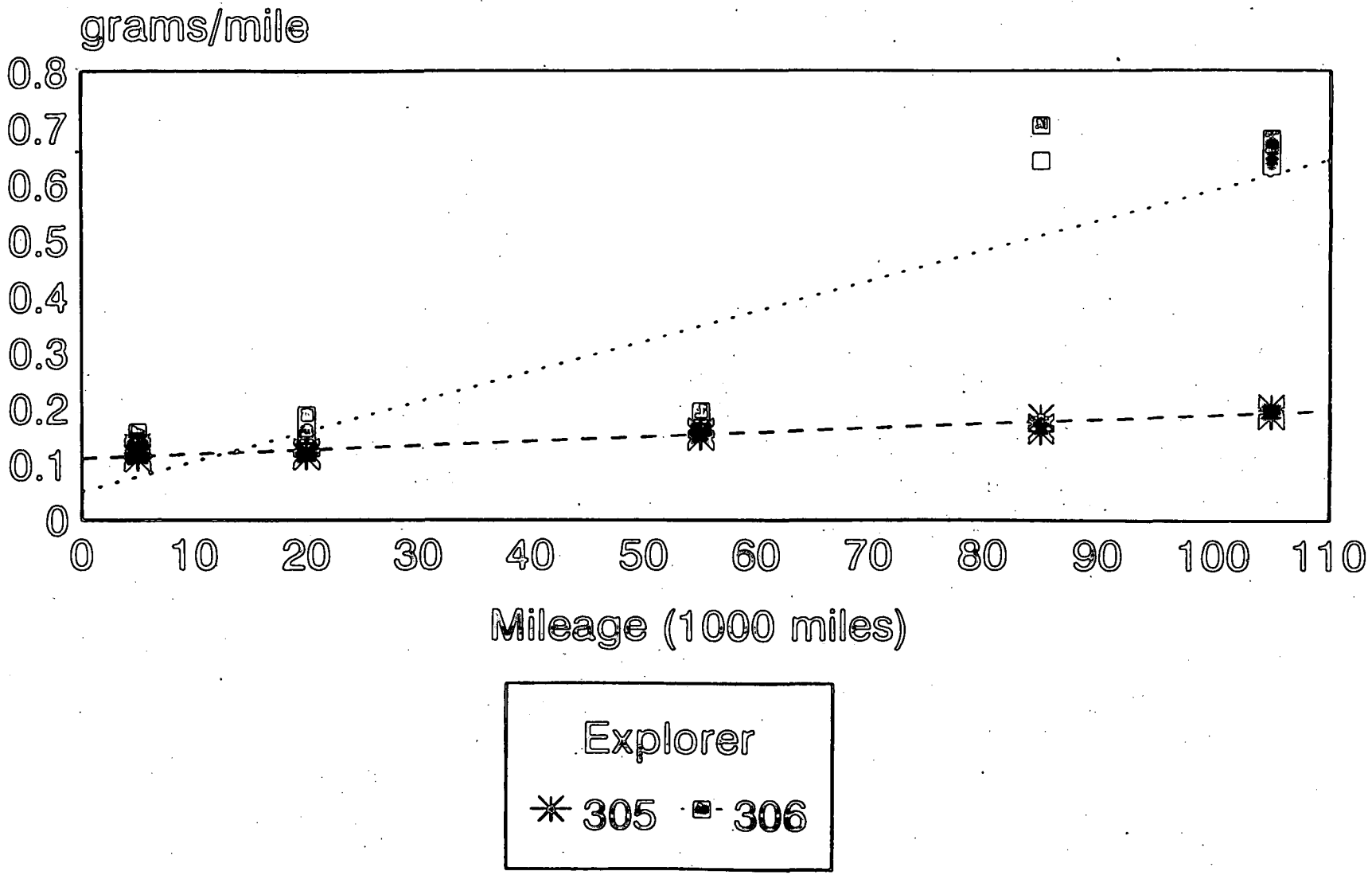
MVMA is still troubled by the lack of post-program evaluation for the functional characteristics of some emission control devices or systems to corroborate statistical conclusions. It is good engineering practice to individually inspect and test components from which conclusions and decisions are drawn after a durability test program. It is self-evident that a finding that the MMT additive will not impair to a significant degree the performance of any emission control device or system (as defined under Section 211(c)(1)(B) of the Clean Air Act) cannot be made unless some of the individual components are functionally checked. Even though Ethyl's test vehicles could pass an emission test, some of the emission control components

may be significantly impaired or operating outside their performance limits. Ethyl's claim that total emissions (HC, CO, NOx) from the test fleet are not adversely affected by MMT does not provide a valid basis to support an EPA determination that the emission control devices and systems are not significantly impaired.

As some MVMA member companies have previously indicated, there are concerns with the Ethyl test protocol. These concerns are as follows (not a rank ordering): Ethyl's use of a subjective decision process as to the number of tests performed at some test intervals creating a much less statistically significant overall data set at each interval; a subjective decision as to the inclusion of some test data; replacement of fuel injectors (not allowed under EPA certification regulations); and the use of a mileage accumulation fuel which is not representative of commercially-available fuel as required by EPA certification protocol. As such, MVMA believes the data and conclusions submitted by Ethyl in support of its waiver application are flawed. A summary of additional MVMA observations and questions is attached.

In conclusion, MVMA believes the Ford test protocol and data more accurately represent the effect MMT has on emission performance in actual customer usage than those of Ethyl's. Ford's data clearly indicate that MMT significantly impairs the performance of emission control devices or systems because it causes and contributes to an HC emission non-compliance condition for the trucks and a significant HC increase for the cars. It is respectfully submitted that Ethyl has failed to provide EPA with data that would enable the Agency to make the required determination. As such, EPA must deny Ethyl's waiver request. The specific effects of MMT on emission control systems will be addressed after further testing by Ford.

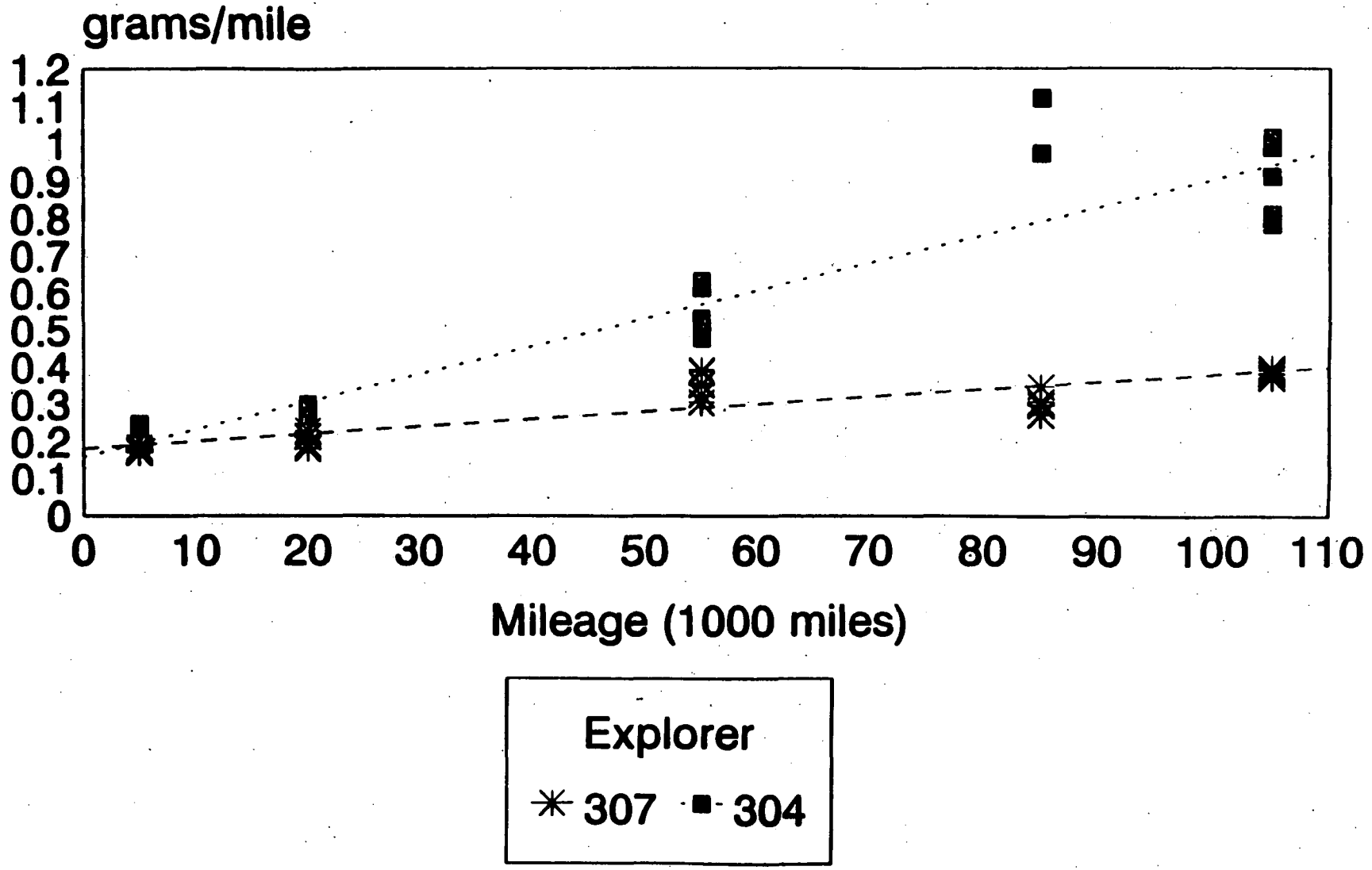
Explorer Fleet
HC Tailpipe Emissions



305- Non-MMT Fuel

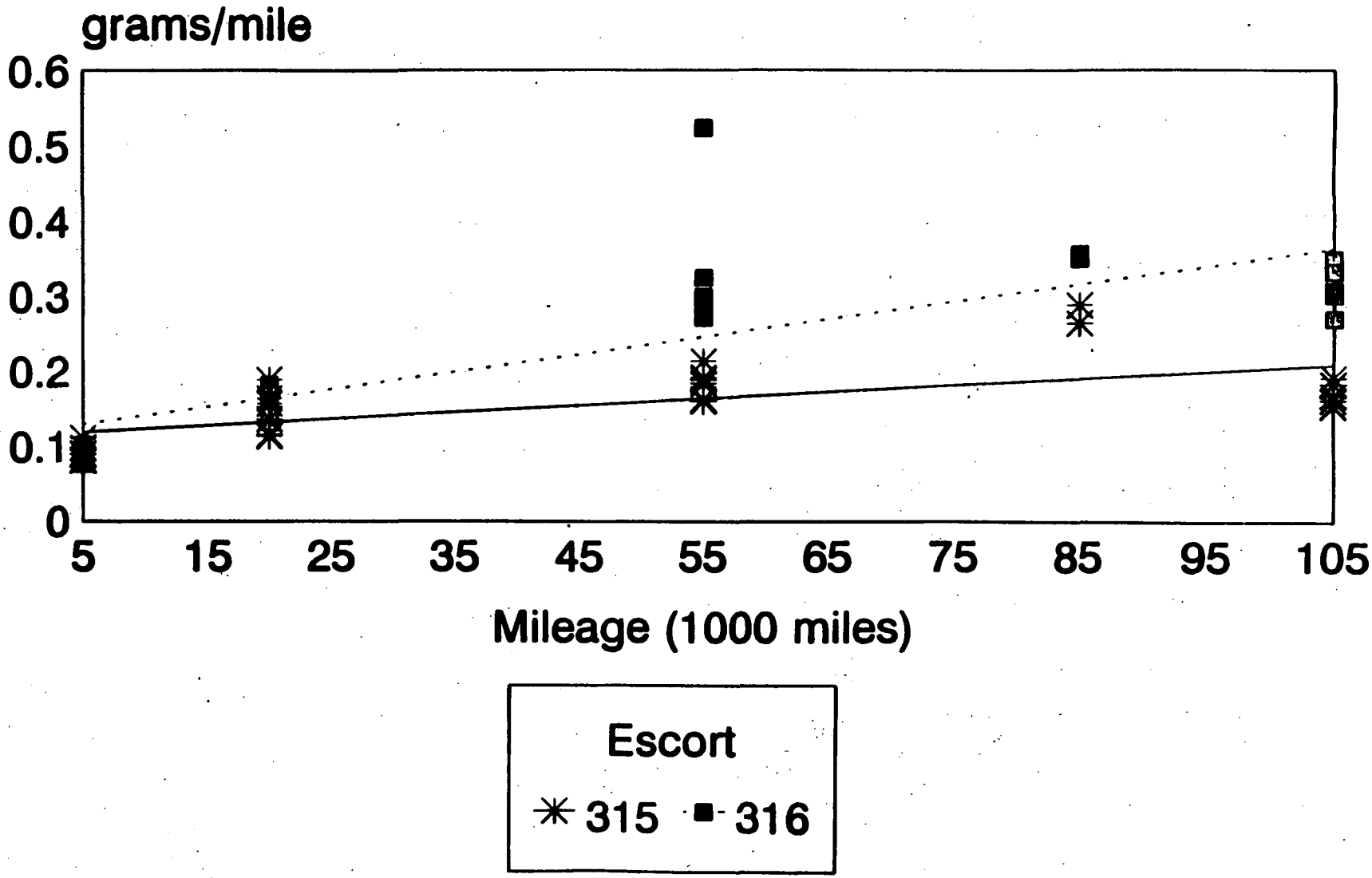
306- MMT Fuel

Explorer Fleet
HC Tailpipe Emissions



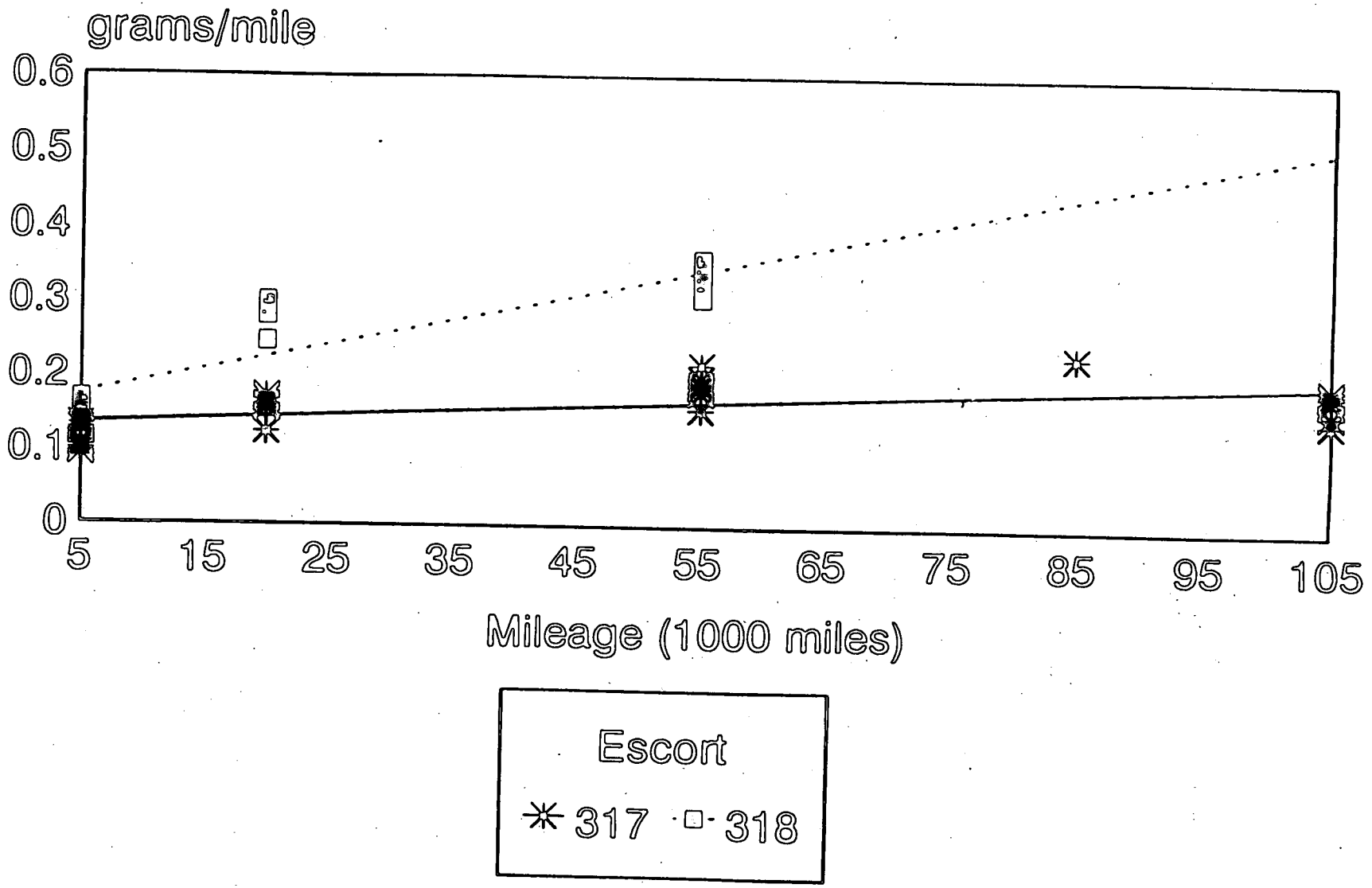
307- Non-MMT Fuel
304- MMT Fuel

Escort Fleet
HC Tailpipe Emissions



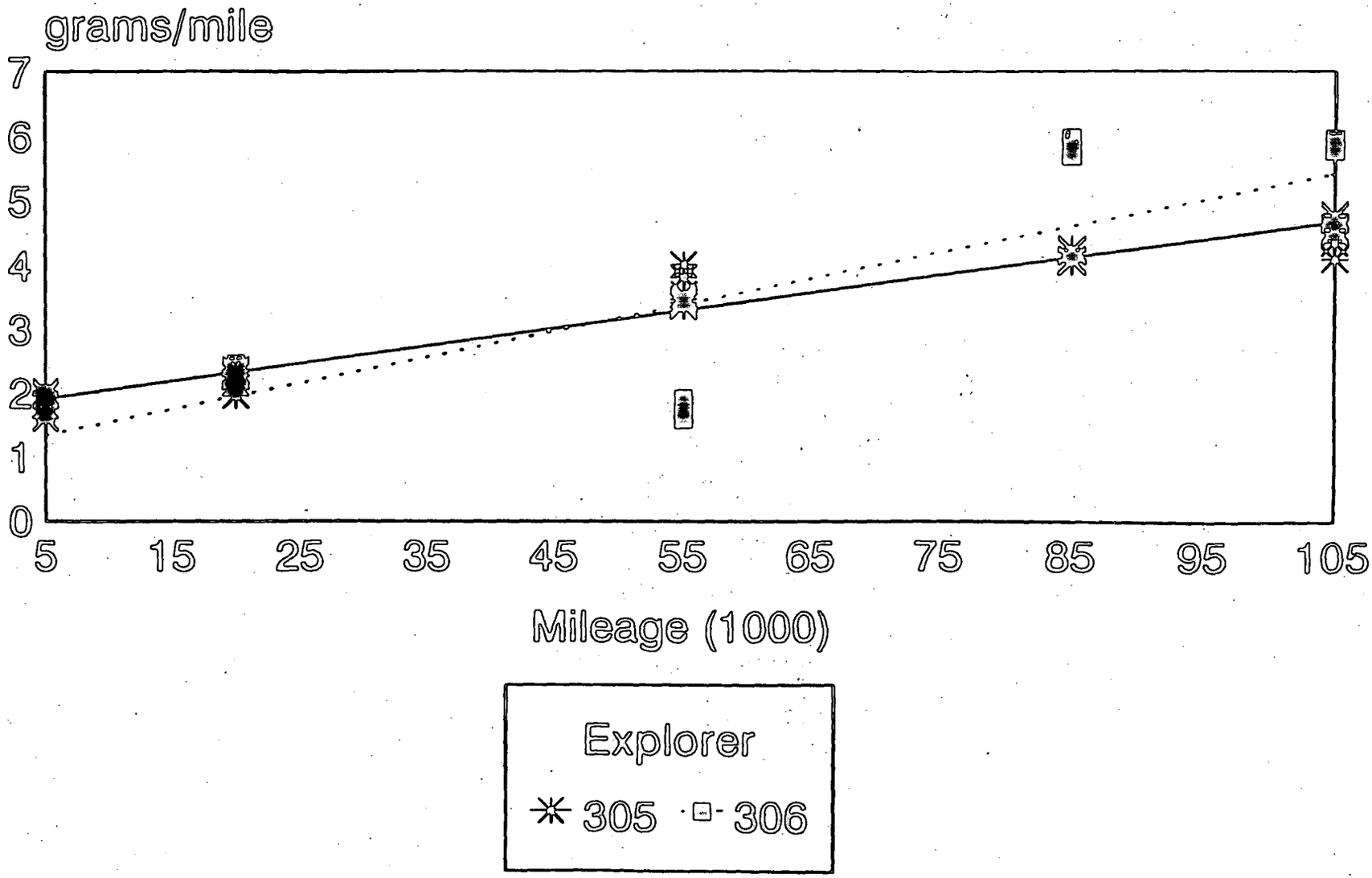
315- Non-MMT Fuel
316- MMT Fuel

Escort Fleet
HC Tailpipe Emissions



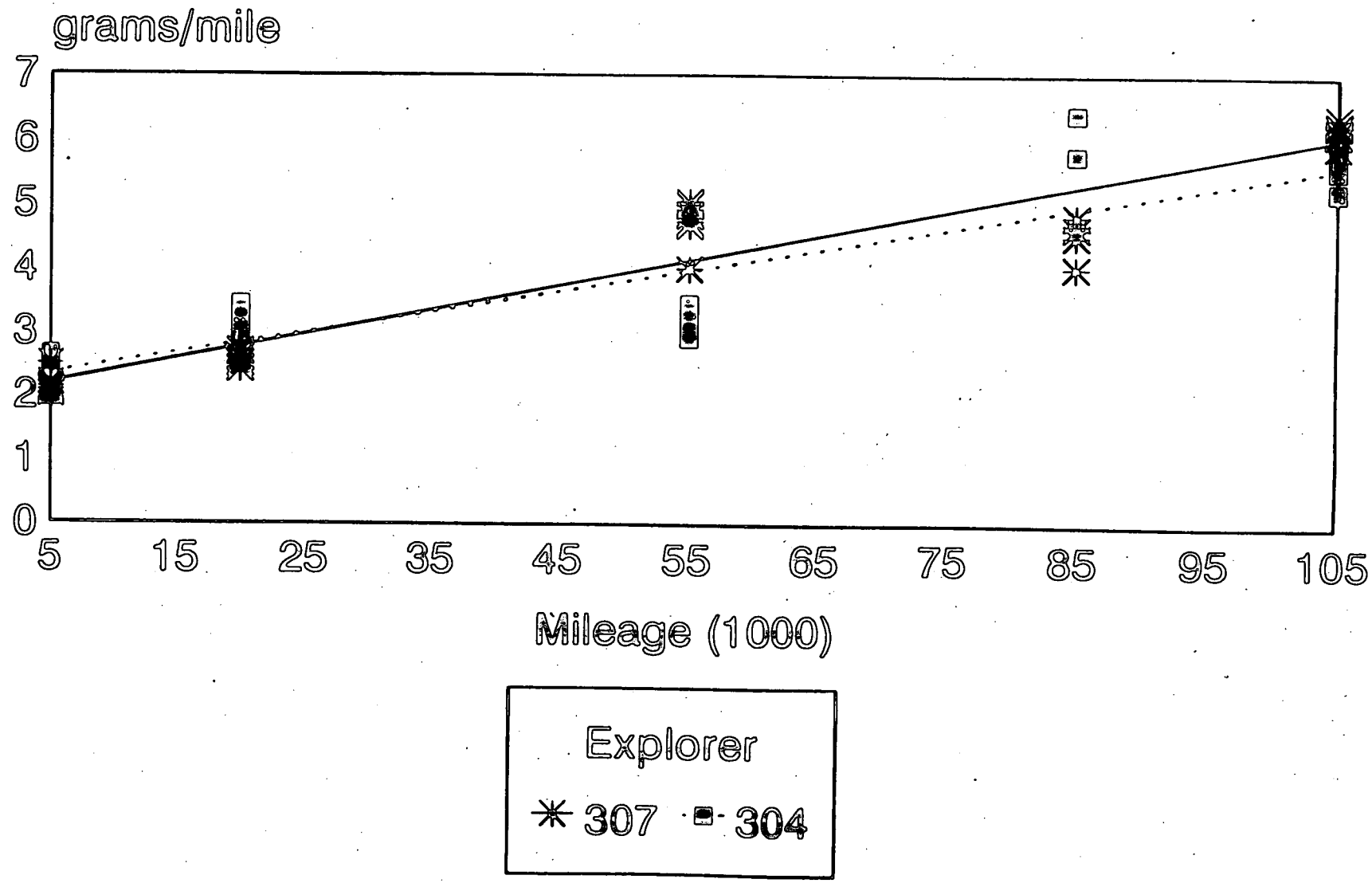
317- Non-MMT Fuel
318- MMT Fuel

Explorer Fleet
CO Tailpipe Emissions



305- Non-MMT Fuel
306- MMT Fuel

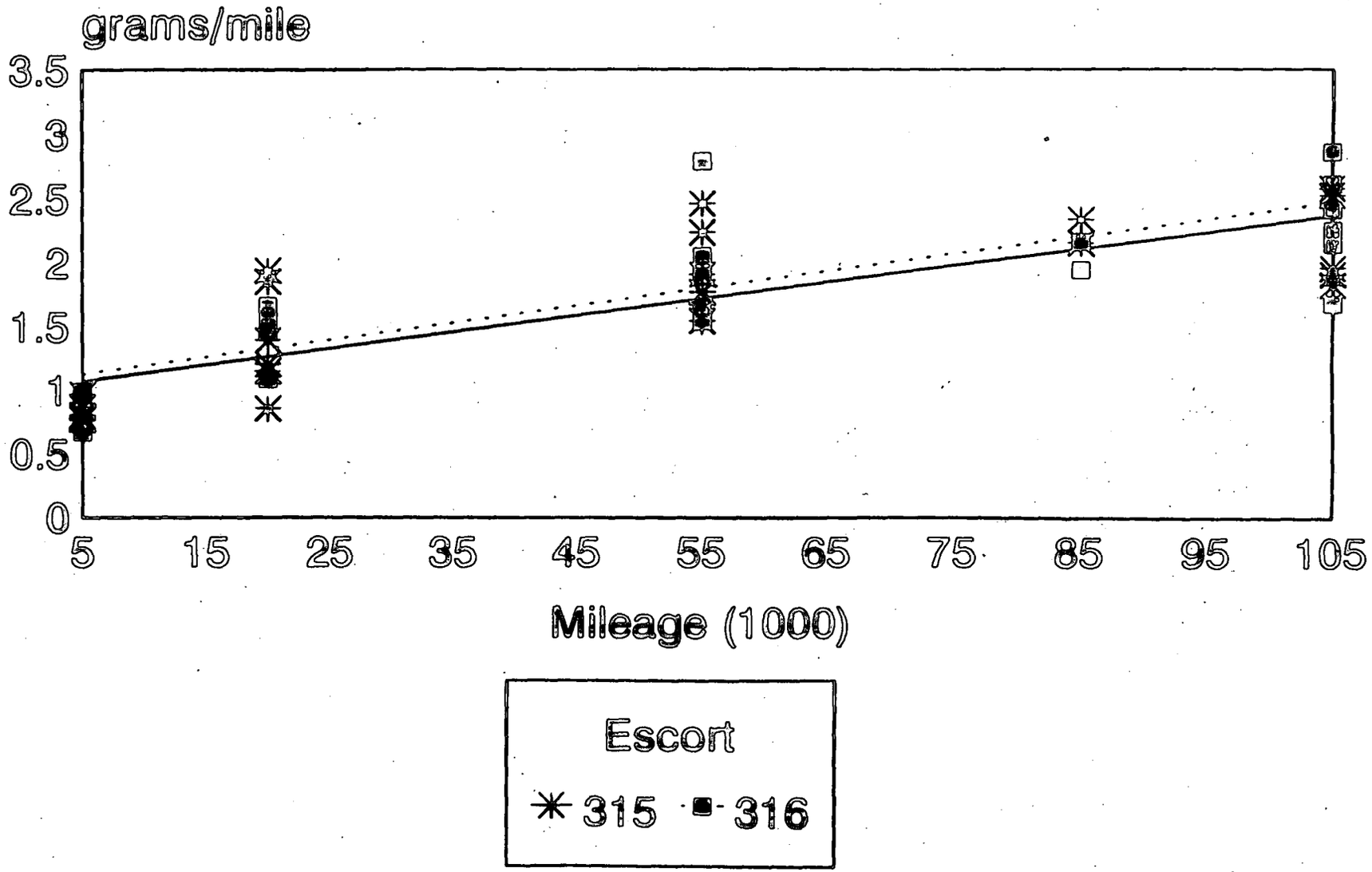
Explorer Fleet
CO Tailpipe Emissions



307- Non- MMT Fuel

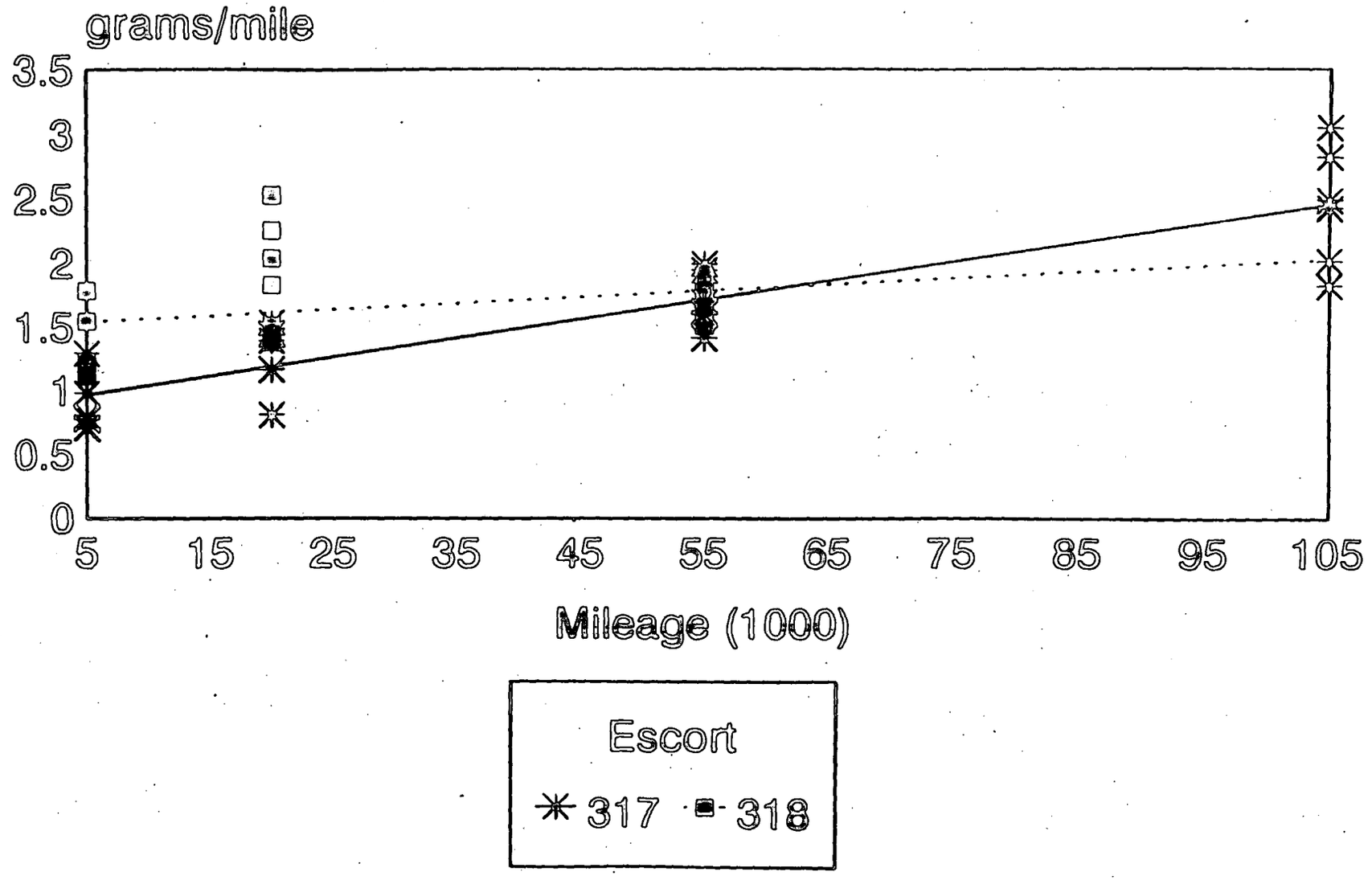
304- MMT Fuel

Escort Fleet
CO Tailpipe Emissions



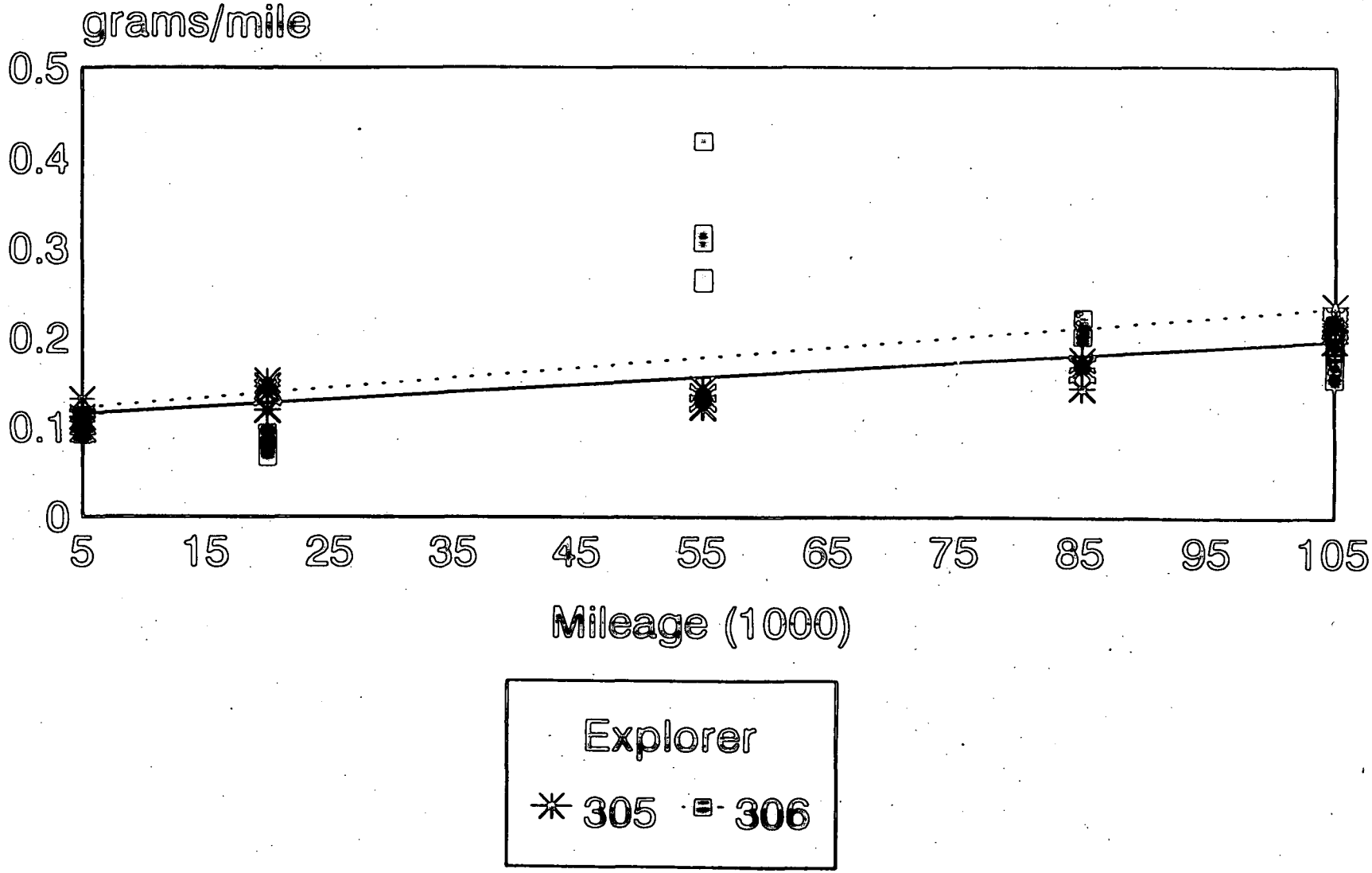
315- Non-MMT Fuel
316- MMT Fuel

Escort Fleet
CO Tailpipe Emissions



317- Non-MMT Fuel
318- MMT Fuel

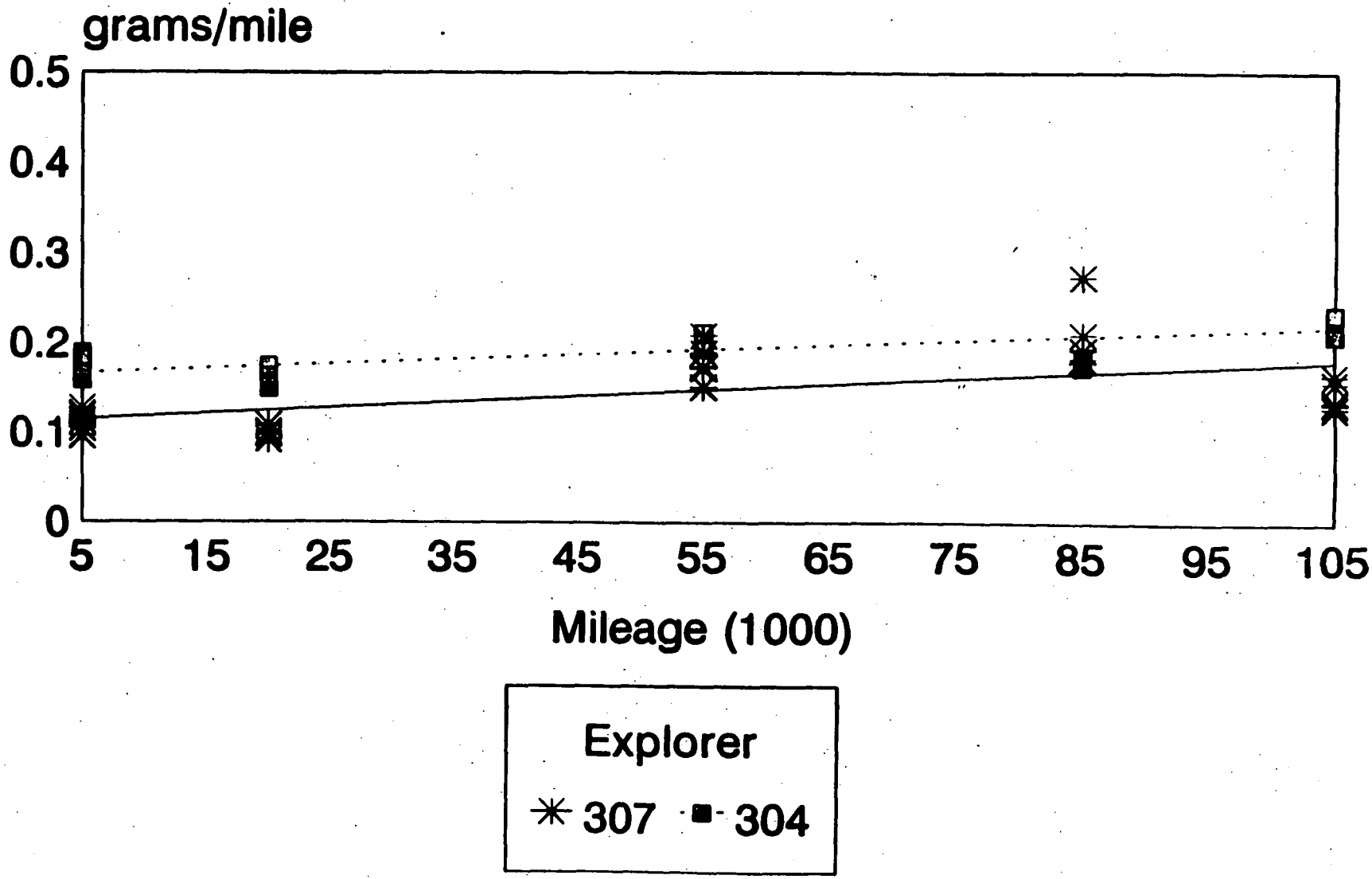
Explorer Fleet
NOx Tailpipe Emissions



305- Non-MMT Fuel

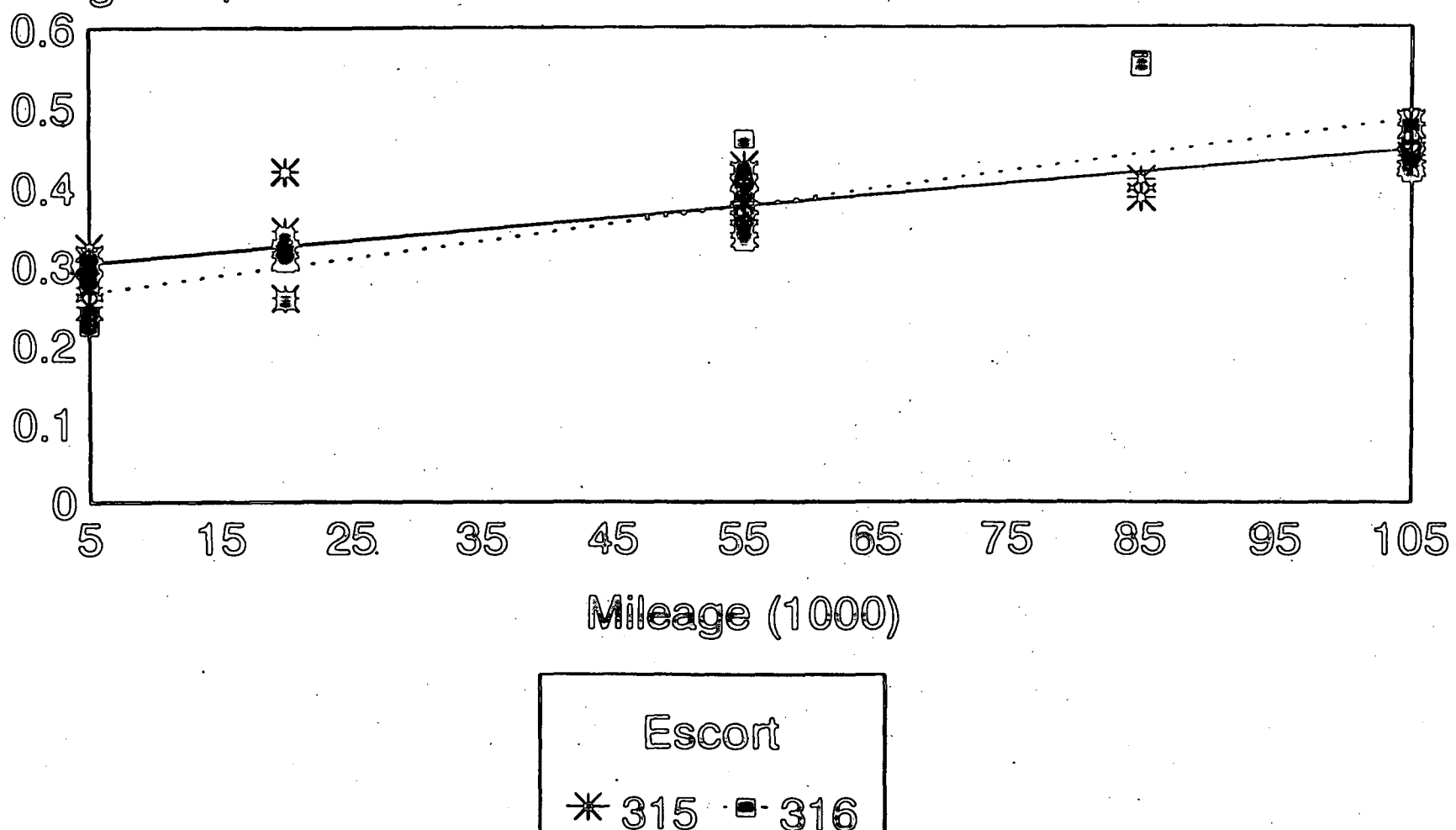
306- MMT Fuel

Explorer Fleet
NOx Tailpipe Emissions



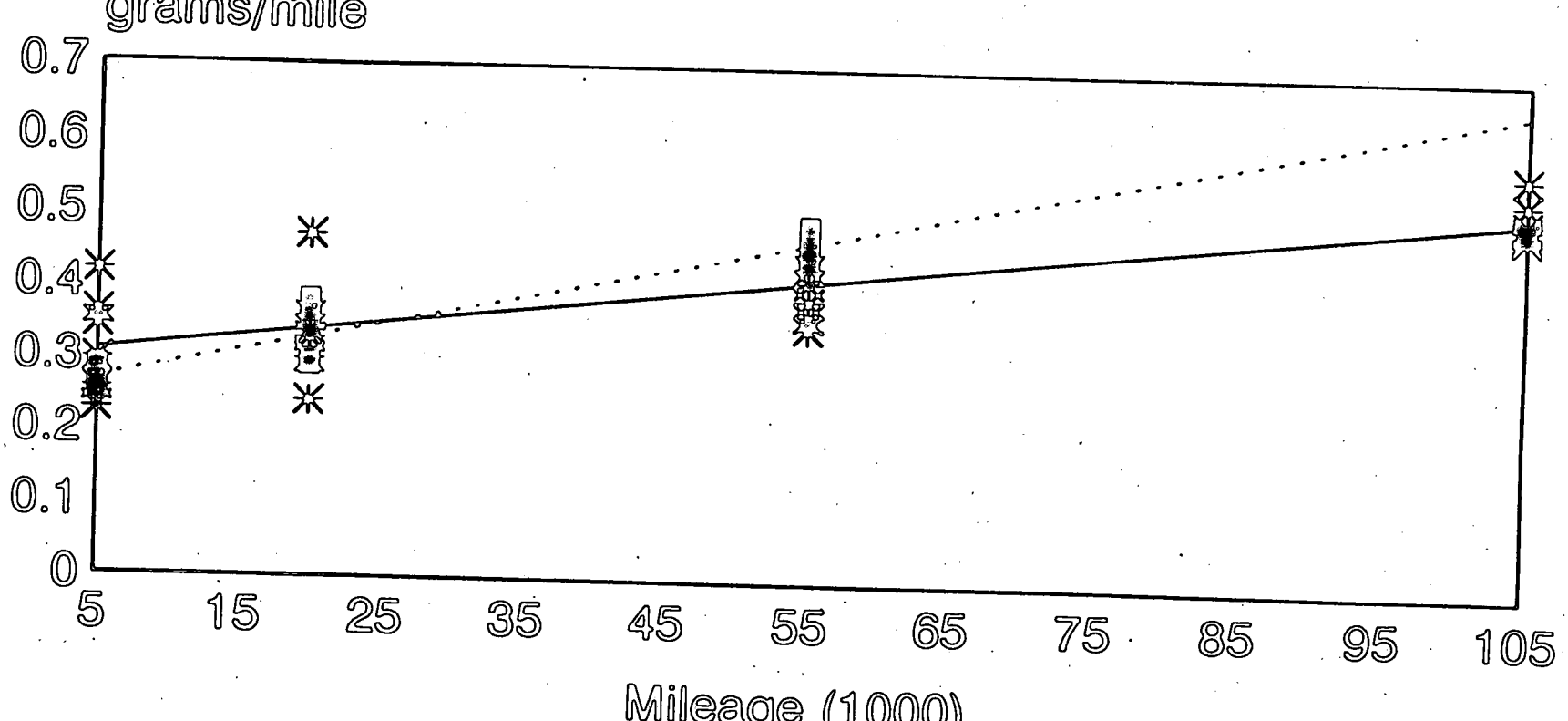
304- MMT Fuel
307- Non-MMT Fuel

Escort Fleet
NOx Tailpipe Emissions



315- Non-MMT Fuel
316- MMT Fuel

Escort Fleet
NOx Tailpipe Emissions



317- Non-MMT Fuel
318- MMT Fuel

MVMA'S REVIEW OF ETHYL CORPORATION'S APPLICATION FOR FUEL ADDITIVE WAIVER DATED JULY 12, 1991

Listed below are some observations and questions based upon a review of Ethyl Corporation's (Ethyl) waiver request for MMT at a concentration of 0.03125 (1/32nd) grams per gallon.

- EPA test data demonstrates that from 4% to 34% of MN in gasoline is emitted from the tailpipe. Ford has measured similar results showing from 6% to 45%. Why does Ethyl claim only 0.5% of the MN would be emitted from the typical car (Appendix 9, Page 19)? However, Ethyl then claims on Page 44 of the Application 10% to 15%. As a second part of this question, it could be assumed from the above data that approximately 80% of the MN in gasoline must be deposited in the engine, emission control system, and exhaust system. Is it not reasonable to assume that MN deposits must then affect the function of the emission control devices and systems?

- Ethyl generated exhaust backpressure test on two Corvettes which if linearly extrapolated to 100,000 miles would show a 4.4 inch-Hg backpressure increase. The 4.4 inch-Hg increase would be a conservative estimate as the increase would probably be more logarithmic rather than liner. These data indicate a potential catalyst plugging problem.

- EPA/ORD has deemed 0.4 ug/m^3 (average daily) as the maximum air level of MN to protect public health. Ethyl's own test data obtained in and around parking garages in Toronto, Ontario ranged up to 0.4 ug/M^3 for the eight-hour measuring period (Page 53 of the Application). How can it be concluded then that there is not a potential problem, since the measured level is close to the EPA maximum (it should be noted that the actual level of MN in Canadian gasoline is not twice that requested for the U.S., but rather from 21% to 42% higher)?

- EPA's October 29, 1990 report concerning the MMT Testing Program indicates a 65% in HC emissions. The FTP HC for non-MMT cars was 0.322 gm/mi, and was 0.531 gm/mi for MMT cars. These data certainly seem to indicate that MMT causes emission non-compliance. We do not agree with Ethyl's argument that test fuel contamination may have caused these high HC levels. Ethyl's own test data, with and without contaminated fuel (Appendix 5A, Page 7), demonstrates under EPA test cycle conditions a 12% increase in HC for city cycle and a 13% reduction in HC for highway cycle. These limited data are inconclusive and do not support Ethyl's conclusion that the EPA 65% HC emissions is a result of the chloride.

- Ethyl's test vehicle fleet ran to 75,000 miles. The current light truck useful life is 120,000 miles, and the 1993 California and 1994 EPA passenger vehicle useful life will be 100,000 miles. Ethyl's test fleet may not have accumulated sufficient mileage to adequately demonstrate that emission control systems are not adversely affected for the entire useful life.

- The gasoline used by Ethyl for mileage accumulation in its 48-car fleet was Howell EEE -- a gasoline widely used for conducting emission measurements using the Federal Test Procedure (FTP). However, Howell EEE is not commonly used for mileage accumulation, because it is not typical of U.S. gasoline in terms of detergency. Howell EEE does not contain any deposit control detergent additives. In contrast, almost all commercially sold gasoline in the U.S. contains such additives -- perhaps, as of 1991, as much as 95% of U.S. gasoline contains such detergents. In the future, the use of these detergents will increase to nearly 100% because the 1990 Amendments added Section 211(l) to the Clean Air Act. Section 211(l) makes it illegal to sell or dispense, after January 1, 1995, "any gasoline which does not contain additives to prevent the accumulation of deposits in engines or fuel supply systems."

  Since the mid-1970s, Ethyl's MMT additive has been known, based on many emission tests on many different engines, to increase engine-out and tailpipe HC emissions. Thus, it is not surprising that Ethyl in its testing for the 1990 and 1991 Requests observed increased engine-out and tailpipe HC emissions. However, we believe the lack of detergent additives in Ethyl's mileage accumulation gasoline impacted the HC emission results. The additional increase in engine-out HC emissions -- above that resulting from deterioration -- reported by Ethyl due to the use of HiTEC 3000 would have been greater if the vehicles had been fueled with a gasoline containing a deposit control detergent additive.

  We believe the waiver applicant for a gasoline additive should test the subject additive in a gasoline which is typical of gasolines in which the additive will be used, if approved. In other words, a typical marketplace gasoline should be used and not an atypical gasoline. If an atypical gasoline is used, we believe the burden of proof requirement of the Clean Air Act cannot be met. Ethyl failed to use a typical gasoline and, thus, there is no way to determine (1) how the use of a non-detergent gasoline impacted emission control performance of Ethyl's 48-car fleet, or (2) if Ethyl's reported emission results would have been different or the same if a detergent-containing gasoline had been used in its fleet test program. Ethyl simply used the wrong gasoline for mileage accumulation in its 48-car fleet.

- Ethyl claims the use of HiTEC 3000 would,"...lower reactive hydrocarbon emissions by 23 to 30 percent and lower regulated toxic emissions by 13 to 28 percent" (1991 Request, "Overview," Page 8). The data on which the claims are based are not as straight forward as Ethyl indicates. By adding xylenes to the base gasolines in order to match the octanes of the gasolines containing HiTEC 3000, Ethyl stacked the cards in favor of HiTEC 3000. We are not sure how many xylenes were added to the base gasolines, but there can be no question that both reactivity and toxic emissions with the base gasolines were increased by adding xylenes. Thus, Ethyl is able to claim reductions in reactivity and toxics through the addition of HiTEC 3000. In the real world, the reductions will not occur because xylenes will not be added to gasoline. That option will not be available to the gasoline marketers.

There are much more likely ways to match the octane boast of HiTEC 3000 instead of adding xylenes. For example, methyl tertiary-butyl ether (MTBE) could have been added to the base gasolines. The claimed reductions in reactivity and toxics with the use of HiTEC 3000 have little to do with future trends.

- Ethyl's data show decreases in converter efficiency. For the General Motors' engines discussed in Appendix 7 of the 1991 Request, Ethyl's data at a Redox Ratio of 1.0 show a converter inefficiency of 6% (a 84% efficiency as shown on Figure 1 of Appendix 7) (100%-94%) for the clear-fueled car, and 8% (a 92% efficiency as shown on Figure 2 of Appendix 7) (100%-92%) for the HiTEC 3000-fueled car. That would correspond to a 33% [(6-8)/6] increase in tailpipe HC emissions -- not an insignificant increase as Ethyl indicates. Figures 7 and 8 show similar changes in converter efficiency at a Redox Ratio of 1. However, this time, the HiTEC 3000-caused increase in HC emissions corresponds to 17%.

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Revised 09/09/91